**SCH4U Unit 5 Electrochemistry:**

Lesson 3: Balancing Redox Reactions using the Oxidation Number Method.

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|  | **Curriculum Connections** |
|  | **Big Ideas:**   * Oxidation and reduction are paired chemical reactions in which electrons are transferred from one substance to another in a predictable way. * The control and applications of oxidation and reduction reactions have significant   implications for industry, health and safety, and the environment.  **Fundamental Concepts:** Matter, Energy, Sustainability and Stewardship  **Overall Expectation: A.** Science Investigation Skills and Career Exploration  A1. demonstrate scientific investigation skills (related to both inquiry and research) in the four areas of skills (initiating and planning, performing and recording, analyzing and interpreting, and communicating).  **Overall Expectation: F. Electrochemistry**  F3. demonstrate an understanding of the principles of oxidation-reduction reactions and the many practical applications of electrochemistry.  **Specific Expectations: (A1) Science Investigation Skills; (F2) Developing Skills of Investigation and Communication; (F3) Understanding Basic Concepts**  A1.11 communicate ideas, plans, procedures, results, and conclusions orally, in writing,  and/or in electronic presentations, using appropriate language and a variety of  formats (e.g., data tables, laboratory reports, presentations, debates, simulations,  models).  F2.3 write balanced chemical equations for oxidation-reduction reactions, using various  methods including oxidation numbers of atoms and the half-reaction method of  balancing [AI, C]  F3.1 explain redox reactions in terms of the loss and gain of electrons and the associated  change in oxidation number  **Learning Goals:**   * Understanding how to balance redox equations using the oxidation number method. * Communicate and utilize problem solving skills through different modes of learning (i.e. kinesthetically, orally, visually, auditory). * Understand the importance of using ratios in common “real-life applications” when balancing redox reactions. |

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|  | **Prior Learning** |
|  | * Keys terminology such as but not limited to: *electron transfer, reduction, oxidation, oxidizing agent, reducing agent, oxidation number*, *LEO the lion says GER*. * Understanding the difference between reduction and oxidation reactions. * Understanding how to balance simple reduction and oxidation reactions. * Understanding how to calculate oxidation numbers. |

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|  | **Materials And Resources** |
|  | Materials:  White board, Computer and Projector, Video – Introduction to Redox Reactions DVD.mp4  Scissors (4-6 pairs)  Appendix A: Chalkboard outline (on whiteboard)  Appendix B: Chalkboard examples and notes ( white board + class copies)  Appendix C: Student problem set and chalkboard solutions (pair or four amount)  Appendix D: Student game (four amount)  Appendix E: Quiz and solutions (Class amount)  Appendix F: Homework (Class amount)  Internet Resources:  Video – Introduction to redox reactions DVD.mp4 taken from:  http://www.youtube.com/watch?v=ICMfgSBNQzs  Excerpts taken from Introduction to redox reactions DVD |

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| 11 min | **Minds On:**   * Create a positive learning environment. * Review and assess prior knowledge. * Set up the context for which learning is done. | **Connections and Rationale for the T/L Strategy** |
| 6 min  5 min | **Class Activity**  Video: Introduction to Redox Reactions  (refer to materials section)  **Class Activity**  Why is it important to understand the ratio of chemicals needed when looking at balancing redox reactions in “real world applications”?   * Ratios come from balanced chemical equations. * Balancing redox reactions determines stoichiometry used in calculation of ratios. * Simple redox reactions can be solved using trial and error but more complex redox reactions require more advanced methods. * Needed in chemical analysis, chemical industry. | STSE  - Review of redox reactions  and oxidation numbers.  - Looking at real world  examples.  STSE  (AFL): Observation/anecdotal  comments.    - Gets students to think about the  importance of balancing equations  and their uses.  - Have the students think  about what important  reactions are utilized in  everyday life (with respect  to electron transfer). |

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| 45 min | **Action:**   * Introducing new and key topics of learning. * Providing practical application of concepts through modes of learning. | **Connections and Rationale for the T/L Strategy** |
| 20 min  10 min  15 min | **Class Activity**  Lecture – Learn and discuss methods of balancing redox reactions (oxidation number method).  (For examples refer to notes in Appendix B)  **Think Pair Share (pair)**  – Students will write an approach to balancing redox  reactions in their own words, then discuss with a  partner.  *Questions to think about:*  What did you have that was the same as your partner?  What was different?  Could you include anything that you thought you missed?  (Notes will be given at the end for the students to compare to.  Refer to Appendix B)  **Groups of Four/pairs - Problem Solving**  **-** Students work on problems in groups solving them  using the oxidation number method.  - Problems will be taken up after they are solved and  handed in.  (Problems and solutions can be found in Appendix C) | (AFL)  - Students are introduced to the topic  and the approaches to solving  redox equations.  (AFL)/(AAL): Observation,  Self-reflection  SIS – Initiating and Planning,  Performing and Recording  Analyzing and Interpreting  and Communicating.  - Students think about the  process of problem solving.  - To support each other and solve  the problems through  communication.  - Students will think about  what they actually learned  and what they do not fully  understand.  (AFL) – Observation and collection  of material.  - Students are required to use  their knowledge to solve  complex redox problems.  - Students utilize communication  and team work skills to develop  problem solving skills.  - Material is assessed only for  learning and identify students level  of learning. |

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| 20  min | **Consolidation and Connection**   * Review and determine what students know. * Provide opportunities for consolidation and reflection. | **Connections and Rationale for the T/L Strategy** |
| 5  min  15  min | **Groups of Four - Game:**  **-** Put the steps of balancing redox reactions in sequential  order.  (Game and Solutions are located within Appendix D)  **Class Activity - Quiz**  - 10 min quiz is given.  - 5 min for take up.  (Quiz and solutions are found in Appendix E) | (AFL)  - Students are required to think  about the steps involved in the  balancing method and being able  to remember the steps will help  students to be able to approach  problems with a lot more comfort.    - The game aspect makes the topic  interesting and focuses on  group/team work to solve the  problem.  (AFL)  - Quiz is used as consolidation  method to ensure maximal  retention of the topic.  - This assessment allows the teacher  To gage the levels of each student  on this particular topic. |

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|  | **Next Steps** |  |
|  | Homefun (see Appendix F)  Read the section on Half reaction method  Give out lesson handout (Appendix A)  Address any questions |  |